

Claims

1 1. A method for detecting fiducial marking on a material,
2 comprising the steps of

3 a. providing material with at least one fiducial marking, the
4 fiducial marking being characterized by the ability to absorb light in a first
5 wavelength range and to fluoresce in a second wavelength range that is
6 outside the first wavelength range,

7 b. directing light at the material in the first wavelength
8 range, to cause the fiducial marking material to absorb the light in the first
9 wavelength range and to fluoresce in the second wavelength range, and

10 c. optically examining the material at a predetermined
11 detection site relative to the material, to determine whether fluorescence from
12 the fiducial marking which is in the second wavelength range is detected at
13 the predetermined detection site.

1
1 2. A method as set forth in Claim 1, wherein the fiducial marking is
2 provided as an intrinsic component of the material.

1
1 3. A method as set forth in Claim 1, wherein the fiducial marking is
2 provided as an extrinsic component of the material.

1
1 4. A method as set forth in claim 3, wherein the extrinsic fiducial
2 marking and the excitation source are characterized such that fluorescence is
3 excited in the extrinsic fiducial marking but not in the intrinsic components of
4 the material.

1
1 5. A method as set forth in Claim 4, wherein the material
2 comprises carpet material, and the fiducial marking is provided in the carpet
3 material.

1 6. A method as set forth in claim 5, wherein the carpet material
2 includes a primary backing, and the fiducial marking is provided in the primary
3 backing.

1
1 7. A method as set forth in claim 6, wherein the fiducial marking is
2 applied to the surface of the primary backing.

1
1 8. A method as set forth in claim 6, wherein the primary backing is
2 at least partially woven from an extruded polymeric material, and the fiducial
3 marking is introduced into the polymeric material.

1
1 9. A method as set forth in claim 5, wherein the carpet material
2 includes face fiber, and the fiducial marking is provided in the face fiber.

1
1 10. A method as set forth in claim 9, wherein the fiducial marking is
2 applied to the surface of the face fiber.

1
1 11. A method as set forth in claim 9, wherein the face fiber is at
2 least partially formed from an extruded polymeric fiber, and the fiducial
3 marking is introduced into the polymeric material forming the polymeric fiber.

1
1 12. A method as set forth in claim 2, wherein the material comprises
2 carpet material having face fiber, and wherein the fiducial marking is provided
3 in the face fiber.

1
1 13. A method of detecting fiducial markings provided in a moving
2 carpet material, the fiducial markings characterized by the ability to absorb
3 light in a first wavelength range and to fluoresce in a second wavelength
4 range that is outside the first wavelength range, comprising the steps of

5 directing light in the first wavelength range at the carpet material, and optically
6 examining the moving carpet material at predetermined locations relative to
7 its path of movement to detect the presence or absence of the fiducial
8 markings at the predetermined locations, and providing output based on the
9 presence or absence of the fiducial markings at the predetermined locations.

1

1 14. A method as set forth in claim 13, wherein the carpet material
2 comprises face fiber combined into a primary backing and a secondary
3 backing which is aligned with and then bonded to the primary backing, and
4 wherein said step of optically examining the moving carpet material is
5 provided before the secondary material is bonded to the primary backing.

1

1 15. A method as set forth in claim 13, wherein the carpet material
2 comprises face fiber combined into a primary backing and a secondary
3 backing which is aligned with and then bonded to the primary backing, and
4 wherein said step of optically examining the moving carpet material is
5 provided after the secondary material is bonded to the primary backing.

1

1 16. A method as set forth in claim 13, wherein the fiducial markings
2 extend transverse to the direction of movement of the carpet material.

1

1 17. A method as set forth in claim 16, wherein said step of optically
2 examining the moving carpet material comprises optically examining the
3 moving carpet material at an array of locations extending transverse to the
4 direction of movement of the carpet material.

1

1 18. A method as set forth in claim 13, wherein the carpet material
2 comprises face fiber combined into a primary backing and a secondary
3 backing which is aligned with and then bonded to the primary backing,
4 wherein the primary backing has a front side and a back side, and wherein
5 said step of optically examining the carpet material comprises optically

6 examining the carpet material by an excitation beam directed at the back side
7 of the primary backing.

1

1 19. A method as set forth in claim 14, wherein the primary backing
2 has a front side and a back side, and wherein said step of optically examining
3 the carpet comprises optically examining the carpet material by an excitation
4 beam directed at the front side of the primary backing.

1

1 20. A method as set forth in claim 14, wherein the fiducial markings
2 are provided in the primary backing, the carpet material is moved over a
3 roller, and said step of optically examining the moving carpet material is
4 performed at predetermined locations relative to the roller as the carpet
5 material is moving over the roller.

1

1 21. A method as set forth in claim 20, wherein the primary backing has
2 a front side and a back side, the carpet material moves over the roller with the
3 back side in proximity to the roller, and said step of optically examining the
4 carpet material comprises optically examining the carpet material by an
5 excitation beam directed at the front side of the primary backing.

1

1 22. Apparatus for detecting fiducial marking on a material, the
2 fiducial marking characterized by the ability to absorb light in a first
3 wavelength range and to fluoresce in a second wavelength range that is
4 outside the first wavelength range, comprising an excitation source configured
5 to direct light at the material in the first wavelength range, and a detection
6 device configured to optically examine a material, to determine whether
7 fluorescence from a fiducial marking which is in the second wavelength range
8 is detected by the detection device.

1

1 23. Apparatus as defined in claim 22, wherein said detection device
2 is configured to receive fluorescence from a predetermined direction, and

1 23. Apparatus as defined in claim 22, wherein said detection device
2 is configured to received fluorescence from a predetermined direction, and
3 wherein the direction of the excitation light is co-linear with the predetermined
4 direction from which the detection device receives fluorescence.

1
1 24. Apparatus as defined in claim 23, wherein said excitation source
2 and said detection device are configured such that the direction of the
3 excitation light is co-axial with the predetermined direction from which the
4 detection device receives fluorescence.

1
1 25. Apparatus as defined in claim 22, wherein the detection device
2 is configured to detect fluorescence in a predetermined wavelength range
3 which is determined by the excitation source and an extrinsic component of
4 the material and which substantially excludes fluorescence from intrinsic
5 components of the material.

1
1 26. Apparatus as defined in claim 25, wherein said predetermined
2 wavelength range is determined by an optical filtering device forming part of
3 the detection device.

1
1 27. Apparatus as set forth in claim 22, wherein the excitation source
2 comprises a Light Emitting Diode (LED).

1
1 28. Apparatus as set forth in claim 22, wherein the excitation source
2 comprises a semiconductor laser.